

## Advanced Coating Removal Techniques Abstract

An important step in the repair and protection against corrosion damage is the safe removal of the oxidation and protective coatings without further damaging the integrity of the substrate. Two such methods that are proving to be safe and effective in this task are liquid nitrogen and laser removal operations.

Laser technology used for the removal of protective coatings is currently being researched and implemented in various areas of the aerospace industry. Delivering thousands of focused energy pulses, the laser ablates the coating surface by heating and dissolving the material applied to the substrate. The metal substrate will reflect the laser and redirect the energy to any remaining protective coating, thus preventing any collateral damage the substrate may suffer throughout the process. Liquid nitrogen jets are comparable to blasting with an ultra high-pressure water jet but without the residual liquid that requires collection and removal. As the liquid nitrogen reaches the surface it is transformed into gaseous nitrogen and reenters the atmosphere without any contamination to surrounding hardware. These innovative technologies simplify corrosion repair by eliminating hazardous chemicals and repetitive manual labor from the coating removal process. One very significant advantage is the reduction of particulate contamination exposure to personnel.

With the removal of coatings adjacent to sensitive flight hardware, a benefit of each technique for the space program is that no contamination such as beads, water, or sanding residue is left behind when the job is finished. One primary concern is the safe removal of coatings from thin aluminum honeycomb face sheet. NASA recently conducted thermal testing on liquid nitrogen systems and found that no damage occurred on 1/16" aluminum substrates. Wright Patterson Air Force Base in conjunction with Boeing and NASA is currently testing the laser removal technique for process qualification.

Other applications of liquid nitrogen operations include cutting of both soft and hard materials. While the laser will not cut materials, it can be used to roughen surfaces and to remove other materials from the substrate including oil, grease, and mold. The space program can benefit from several of these applications with the need for precise removal of coatings and other organic compounds in areas adjacent to sensitive space flight hardware. Significant advantages are evident when comparing liquid nitrogen and laser removal operations over current techniques of media blasting and sanding.